Got Wireless? Modify a Simple 12VDC Wireless Remote Control for 5VDC Operation

Written By: Kevin Fodor

TOOLS:

- Desoldering Braid (1)
- Desoldering Bulb (1)
- PanaVise (1)
- Soldering iron (1)

PARTS:

- Hookup wire, 22 AWG (1)
- Songle SRD-05VDC-SL-C 5VDC Relay (1)
  optional, needed only if you intend to still use a relay as your output control
- RF Remote Control Transceiver and Receiver Pair (1)
  Various Manufacturers and (eBay)

SUMMARY

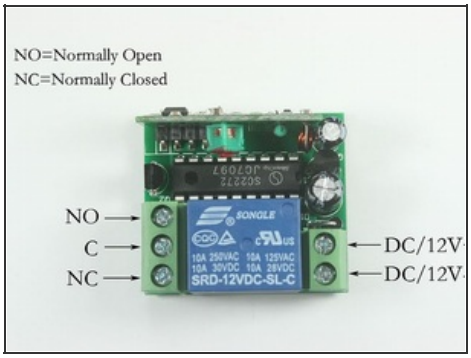
Adding a remote control switch to nearly any project is easy with these small keyfob-based RC relays. They are very inexpensive (<$20) and offer such options as MOMENTARY and TOGGLE operation as well as multiple relay channels to control.

However, from what I found, these units require 12VDC to operate properly. This article explains how to convert one to use only 5VDC.

Additionally, a further mod converts this unit to provide a simple non-mechanical logic level, +5V/0v signal to use as an input to a micro-controller input or other circuit. This allows anyone to add a remote control switch capability to nearly any project, even if they don't need to control big loads through a relay.

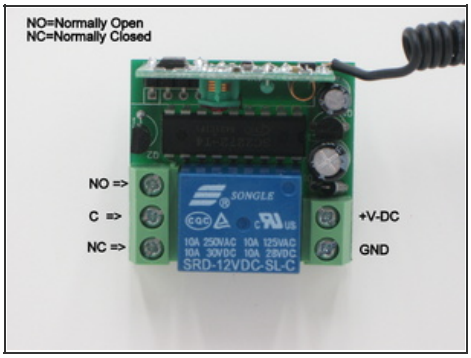
In this short project I am going to explain the basics of these wireless control devices, explain which sections need to be hacked (changed) and finally how to test the modifications.

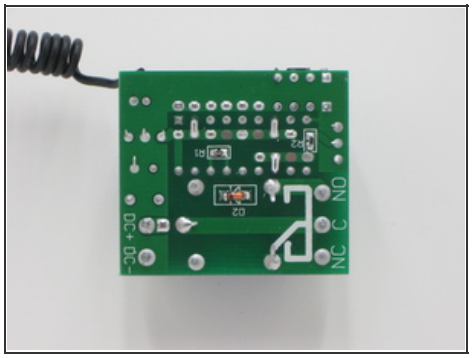
Step 1 — Overview

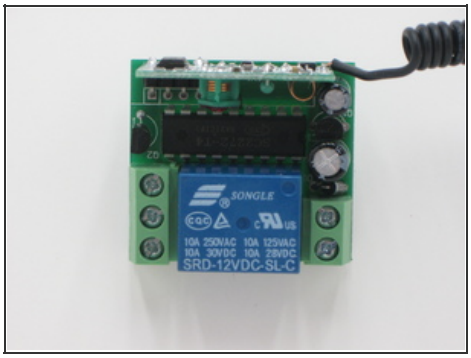


- Shown here is a typical unit you will find on eBay and other discount online outlets. It basically involves both a transmitter (keyfob) and receiver. The transmitter is typically a single-button keyfob but depending on the model purchased it may have more buttons and thus more channels.
- The receiver is made up of two parts; the RF front end and the decoder. Both are packaged together in the same enclosure.
- Both boards are compactly mounted in a small plastic box which makes it incredibly convenient to include and isolate within your own projects. Or you can remove the plastic enclosure altogether.

Step 2 — Initial Checkout

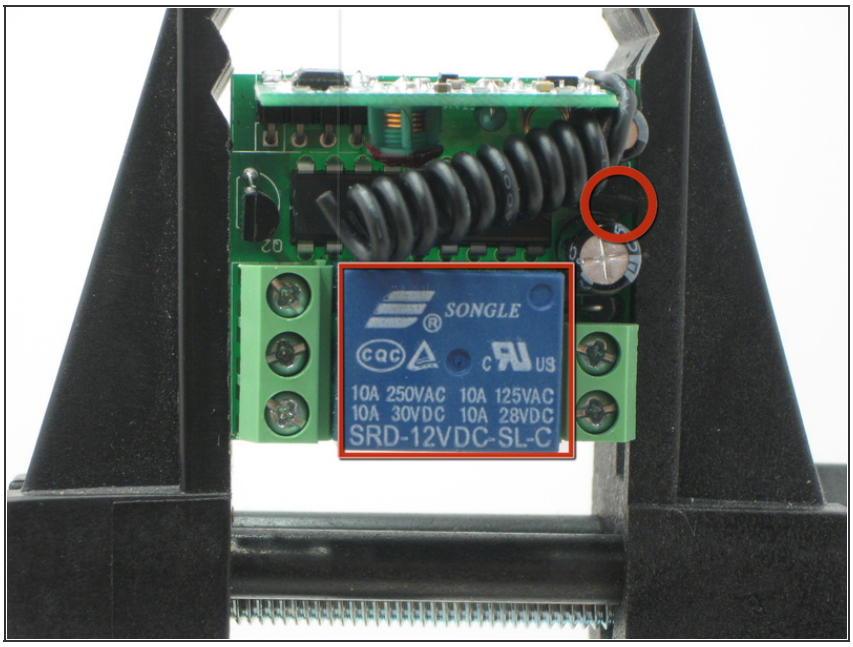






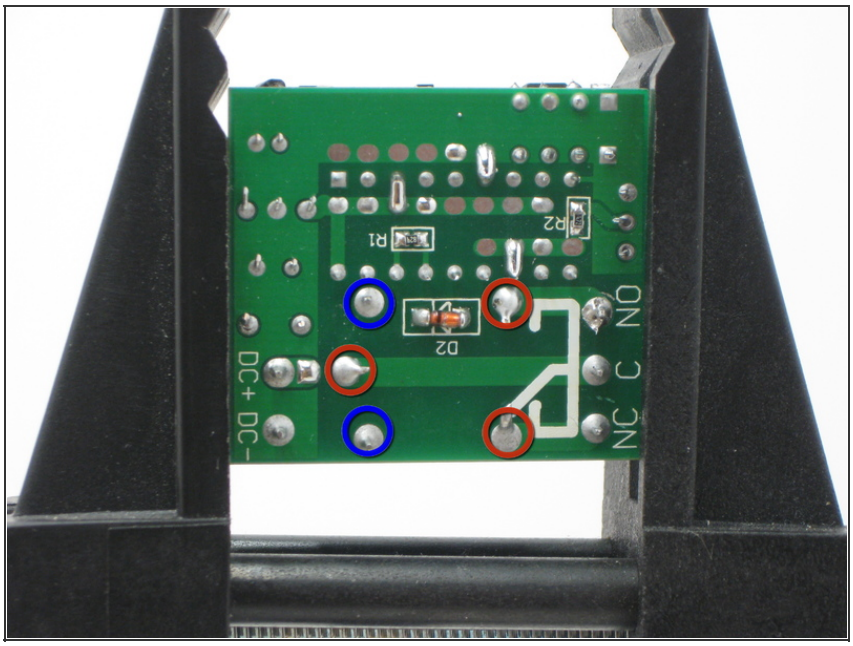
- Before making any modifications it is probably best to verify that the unit works as expected. The unit here is a 12VDC operated version which acts as a remote MOMENTARY switch. The relay used to control a load has Normally-Open (NO) and Normally-Closed (NC) contacts.
- Try connecting a simple load (a lamp) to the relay contacts and see that when the transmitter button is pressed the light turns on.

Step 3 — Identify the Parts



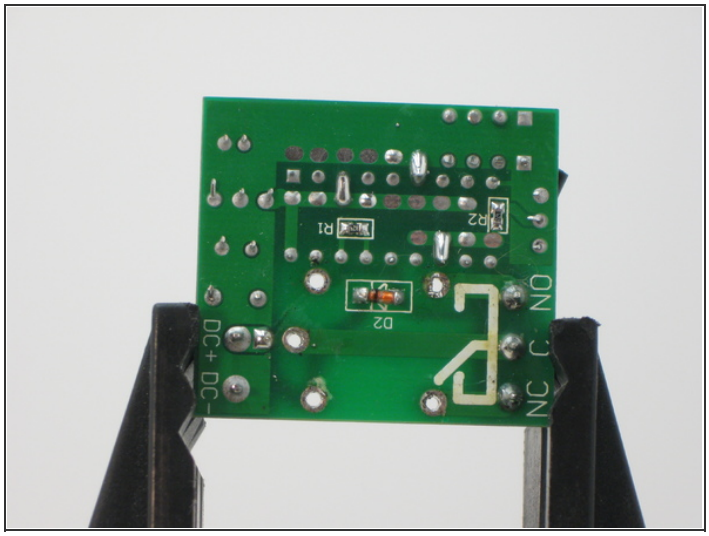
- Now we need to hack the module so that it can operate from 5VDC rather than 12VDC. But first let's identify the parts involved.
- Pull out the receiver PCB from the plastic case and place it into a vise.
- Locate the 12VDC relay and 78L05 voltage regulator; both of which we will be removing.
- On this board the voltage regulator is labeled as Q1 and will be in a 3-pin TO-92 package.
- The relay is the big blue 5-pin object in the center.

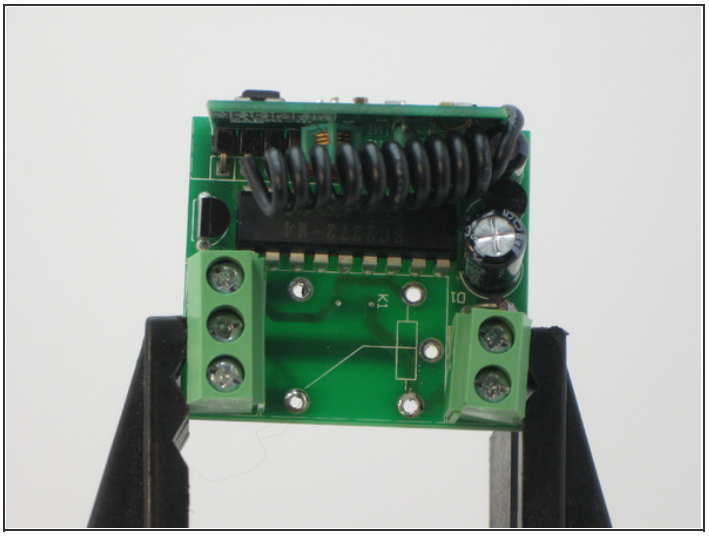
Step 4 — De-Solder the Relay



- Flip the PCB over and locate the 5 pins of the 12VDC relay.
- There are 5 pins on this relay that must be de-soldered. The blue markers indicate where the relay coil pins are. The red marks indicate the relay contact points.
- Heat each of the pins and use a solder bulb and wick to clean out all the solder holding the part in place.
- Gently pry the part off the PCB carefully.

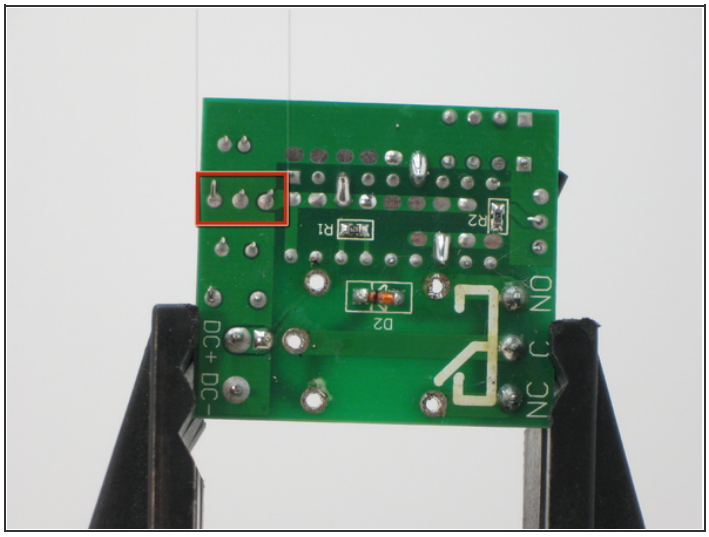
Step 5 — Inspect Your Work

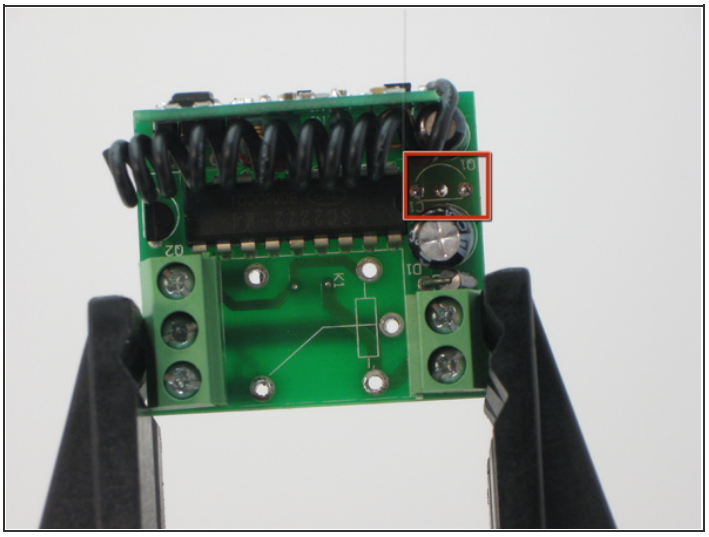




- Shown here is the PC board with the de-soldered relay removed. Make sure the holes are completely cleaned of solder.

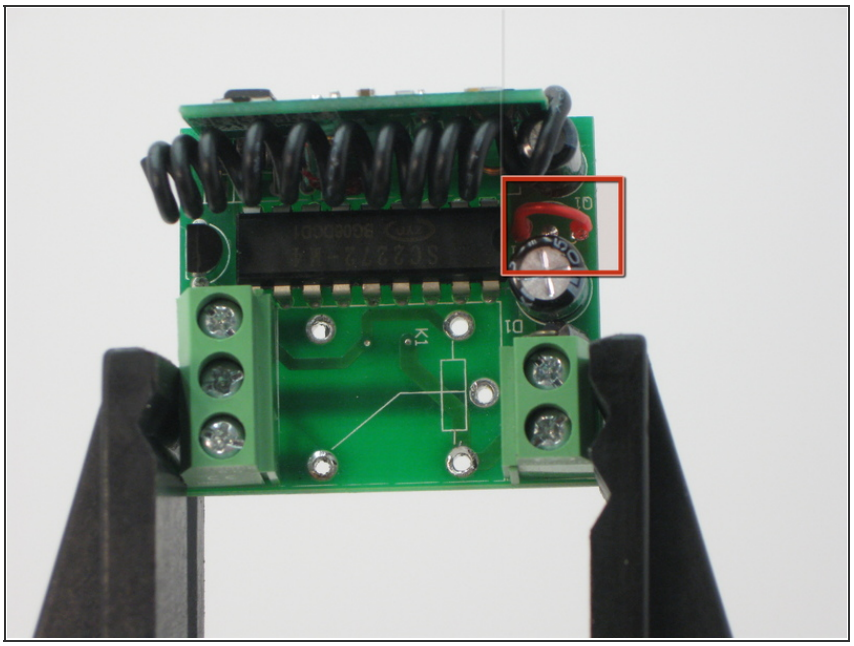
Step 6 — Remove the Voltage Regulator (Q1)





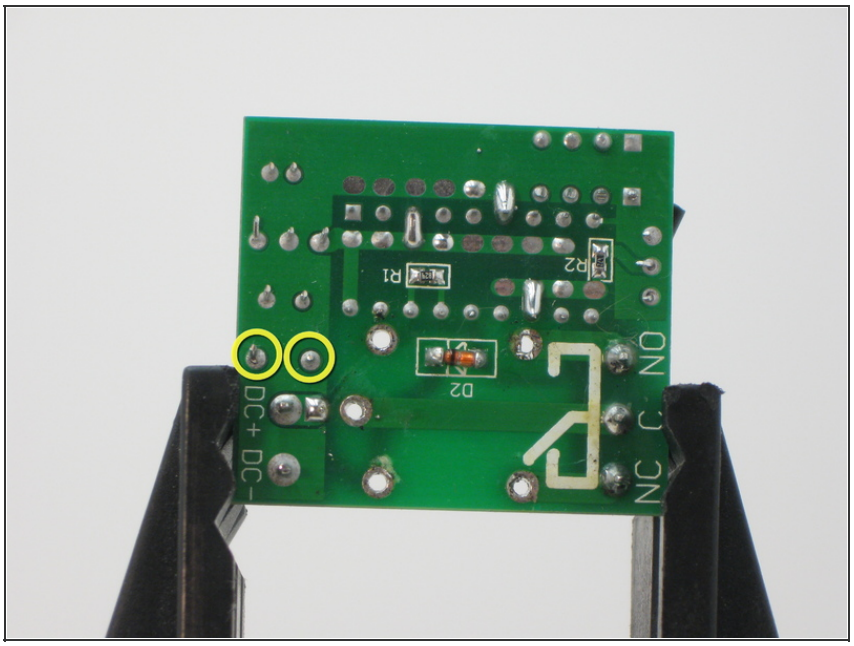
- Now locate the 78L05 voltage regulator. This part is labeled Q1 and shown in the photo with a red rectangle.
- Desolder using a desoldering bulb and wick. Remove solder from all 3 pins of the TO-92 package.
- Gently remove the regulator. If you have trouble you can cut the leads. Just be sure to keep the PCB traces intact and not apply too much heat.

Step 7 — Short the Voltage Regulator Pins



- Insert a jumper wire between pin 1 and pin 3 of the 78L05. This will effectively take the input voltage and provide it directly to the output. The middle pin is already connected to ground.
- Be careful choosing a new 5VDC supply for this circuit as it now must be a regulated 5VDC supply. There is no longer any on-board voltage regulation.

Step 8 — Remove and Short Reverse Voltage Protection Diode.



- Desolder the 1N4007 diode located above the DC power input terminal block. If you don't do this you will loose about 1.0V from your power supply (so a 5V input results in only 4V to the circuit).
- Solder a wire between the two diode terminals in place where the diode was.
- Again, keep in mind that by doing this your module no longer has reverse input voltage protection...so be careful.

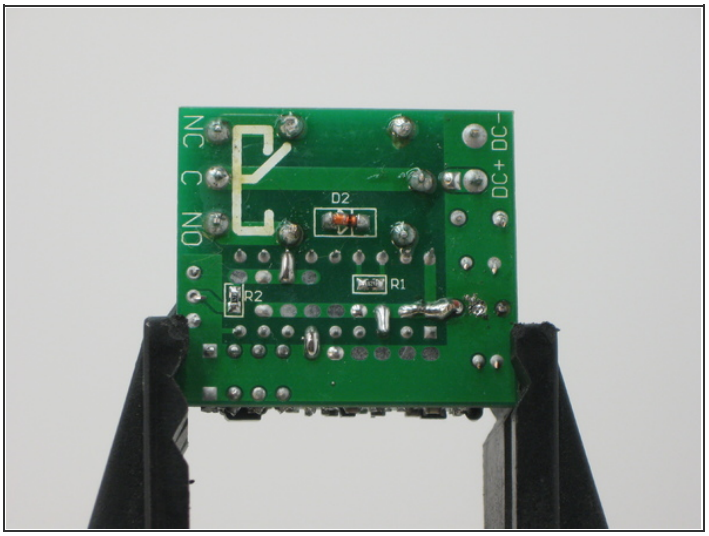
Step 9 — Project Variations

- Variation #1: If you have decided that this receiver needs to be able to continue to control a relay to drive the intended load, continue to step #10.
- Variation #2: If you have decided that this receiver needs to be able to drive a logic control signal instead, continue to step #12.

Step 10 — Project Variation #1: Replace Relay with 5VDC Operating Relay

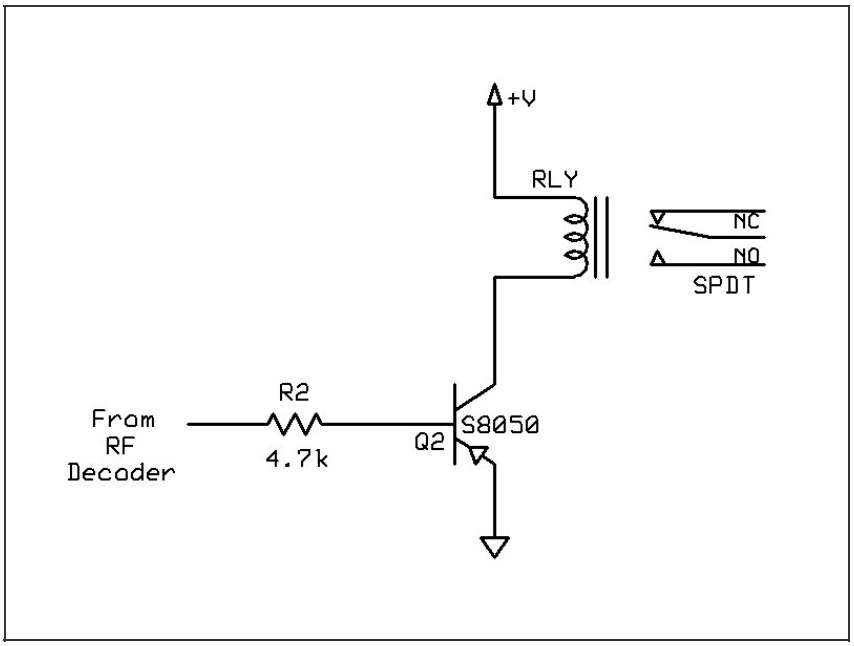
- This variation will show you how to modify the module so that it operates a 5VDC relay in response to the transmitter button being pushed.
- Here we show a SONGLE SRD095VDC-SL-C 5VDC relay we are going to replace the previous 12V relay with. Notice that the footprint is identical.

Step 11 — Project Variation #1: Install the New Relay



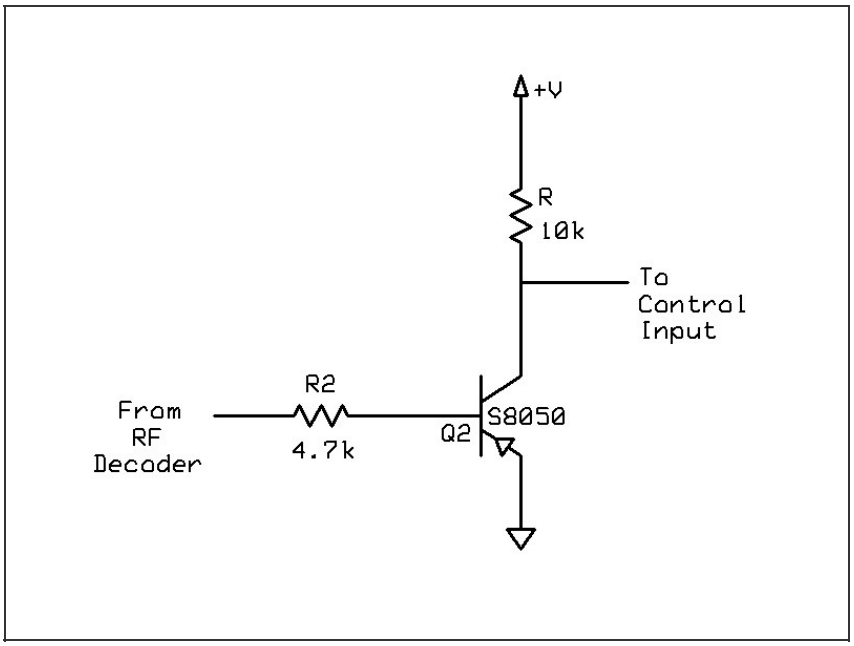
- Place new 5VDC relay into the same position the 12VDC relay was in.
- Flip over the PCB and solder it into place.
- Now proceed to step #14 - Testing.

Step 12 — Project Variation #2: Modify to Provide A Logic Signal Output



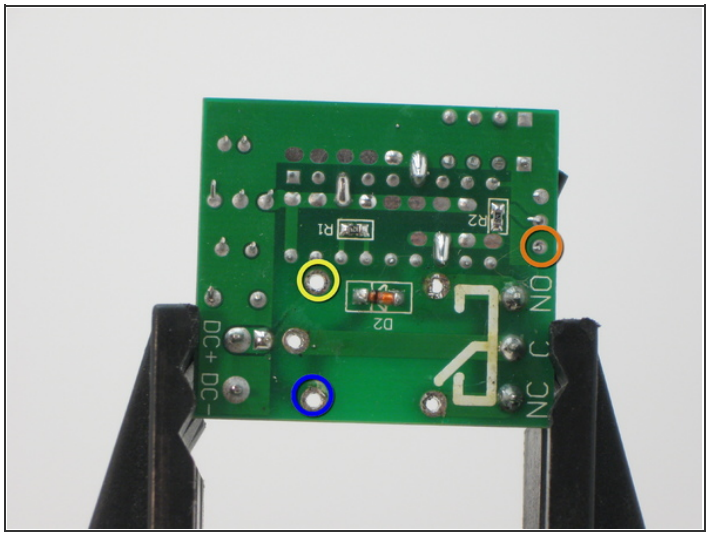
- This variation will show you how to modify the module so that it outputs a logic control signal in response to the transmitter button being pushed.
- The photo to the left shows a simplified version of the output driver for the relay from the RF decoder. Since we removed the relay I am going to show you how to modify this circuit to output a logic control signal instead.
- The PNP transistor (Q2) is used to drive the relay. Instead of driving a relay we are going to tap off of this output.

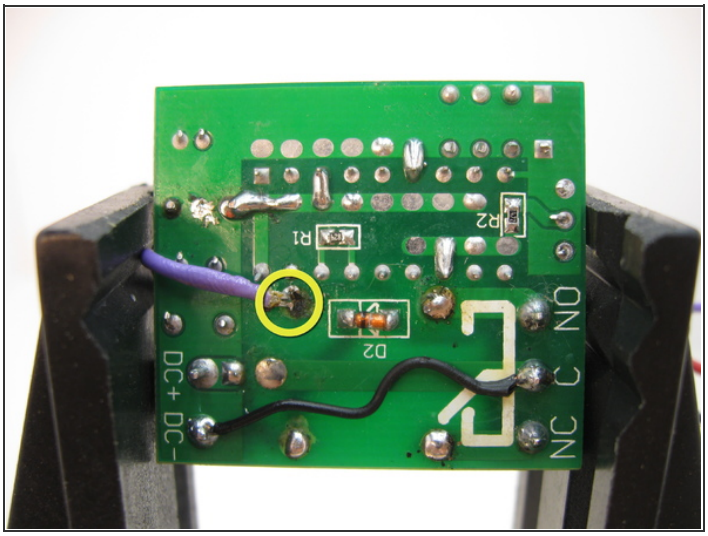
Step 13 — Project Variation #2: Circuit Modification



- The photo on the left shows that we need a pull-up resistor from Q2's collector pin to the supply voltage. This resistor (R) goes in place where the relay coil used to be.
- The collector pin from the S8050 PNP transistor now provides us with a logic control signal output.
- When the transmitter button is pressed Q2 turns on and the control signal is low (0V).
- When the transmitter is not pressed Q2 is off and the control signal is high (+5V).
- If the circuit you are trying to drive doesn't already have a pull-up resistor, you will need one (typically 10k) to pull the output high when the transistor is not on. But if your circuit already has a pull-up you do not need to install one.

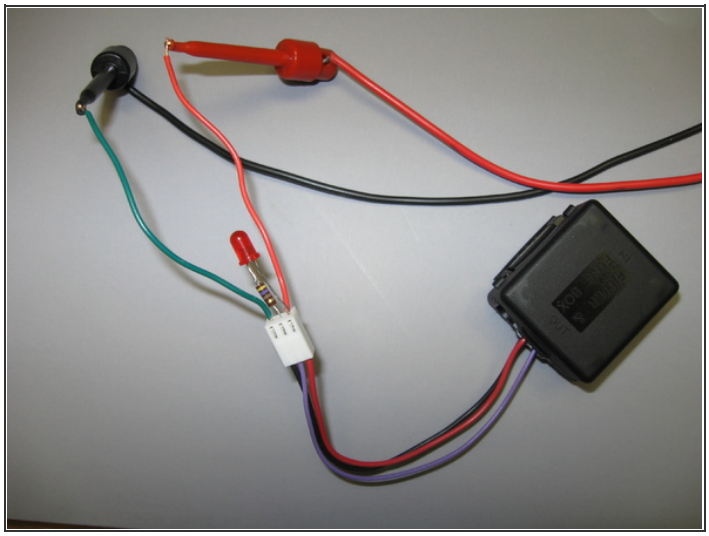
Step 14 — Project Variation #2: PCB Modification

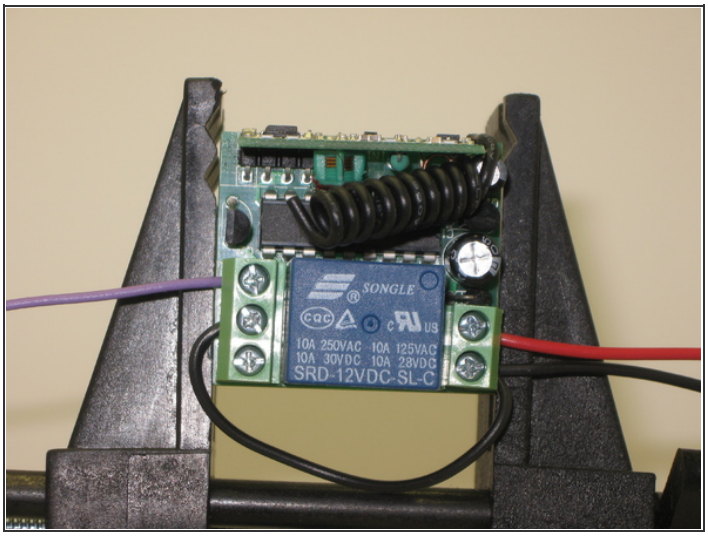




- The photo to the left shows the connections on the PCB we are concerned about.
- The yellow marker shows the collector side of the relay coil. This is where we will tap off our logic control output signal.
- The blue marker is the relay coil's +V supply (which is now going to be +5V).
- The orange marker indicates where the Q2 collector pin is located. It is also electrically connected to the yellow marker as well.
- Remember, you do not need a pull-up resistor if your circuit already has one. In my case the circuit I intended to drive already had a pull-up resistor, so I did not install one here.

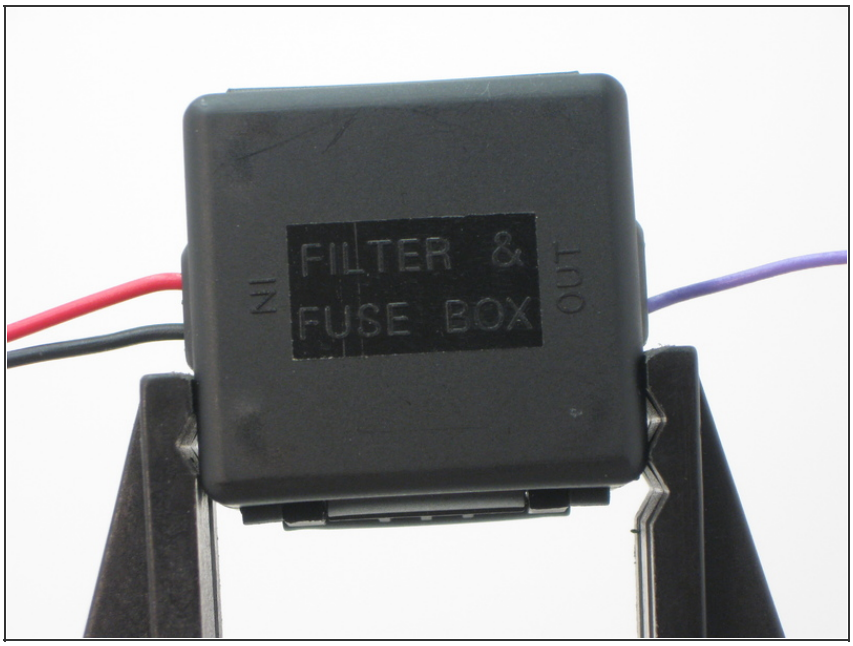
Step 15 — Test





- Test your modification, but be sure to only apply 5VDC for now on to the input terminals (there is no longer a voltage regulator in place, so be careful). The test here is shown with the relay modification, but the same idea is applicable with the logic signal modification as well.
- Attach the output wires and any connectors you need to use. You can use either the normally open or normally closed output to test.
- In this photo you can see I am simply applying a 5VDC power source and I am checking that I can remotely operate the small LED using the transmitter.
- The second photo shows how I wired up my test circuit inside. In this example I tied the common connection from the relay to ground and the normally open connection to the LED's cathode. The anode of the LED was connected to the +5V supply via a current-limiting resistor (~1k).
- This allowed me to test operation by pressing the button and observe that the LED would turn on.
- By the way, I also added a small Molex connector which I will use to provide power to the module and receive the signal from the module. This connector is available at Mouser and other electronics suppliers. Click Here For Connector Parts.

Step 16 — Finished!



- That's it! You're done. Now all you need to do is mount it in the enclosure of your own project.
- With certainty this hack voids the warranty, which makes it even more fun to be able to modify something in such a way to use it as it was not originally intended.

After using these instructions you will be able to convert a 12VDC operated wireless switch to a 5VDC operated one with either a relay or logic level +5V/0V output.

This document was last generated on 2012-11-01 08:06:14 AM.